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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,415	03/26/2004	Liang Liu		2618

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EXAMINER

SANTIAGO, MARICELI

ART UNIT PAPER NUMBER

2879

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/14/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/811,415

Applicant(s)

LIU ET AL.

Examiner

Mariceli Santiago

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 13-16 is/are rejected.
- 7) ☒ Claim(s) 9-12 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Amendment***

The Amendment, filed on December 5, 2006, has been entered and acknowledged by the Examiner.

Claims 1-16 are pending in the instant application.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-6, 13, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (2003/0027478 A1) in view of Dai et al. (US 6,232,706).

Regarding claim 1, Park discloses a method for making a carbon nanotube-based field emission device comprising the steps of providing a substrate (18) having a surface, forming a carbon nanotube array (17) extending from a selected area of the surface (Paragraph [0028]), forming a cathode electrode (15) on a top of the carbon nanotube array, and removing the substrate (18) so as to expose the bottom surface of the carbon nanotube array (Fig. 3C), so that the bottom surface of the carbon nanotube array is thereby configured for acting as an electron emitting surface of the carbon nanotube-based field emission device. Although Park appears to show a substrate having a flat surface (Fig. 3B), Park fails to explicitly state that the substrate has a flat surface and the CNT's array has a flat bottom surface corresponding to the flat surface of the substrate. Park discloses directly growing the CNT's array over the surface of

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the substrate (Paragraph [0028]), however, fails to disclose forming a catalyst layer on a selected area of the flat surface of the substrate.

In the same field of endeavor, Dai discloses a method of growing self-aligned CNT's array over the surface of a smooth<sup>1</sup> substrate (22, Column 2, lines 30-31) by providing a catalyst layer (26) on a selected area of the smooth surface of the substrate. The disclosed method exemplifies the manufacture of CNTs in a confined patterned region, which allows for an accurate control of the size, shape, and distribution of the bundles on the substrate surface (Column 4, lines 31-35). Thus, it would have been obvious at the time the invention was made to a person having ordinary skills in the art to incorporate the step of forming a CNT's array by growing the CNTs from a catalyst layer formed over the smooth surface of a substrate as disclosed by Dai in the method of Park in order to manufacture an array of CNTs in a confined patterned region, which allows for an accurate control of the size, shape, and distribution of the bundles on the substrate surface. Moreover, given that the nanotubes of the combined references to Park-Dai are grown from a surface of the substrate, the bottom surface of the CNT's array has the same bottom profile surface of the substrate, (i.e. a smooth surface).

Regarding claim 3, Dai further discloses a method wherein the substrate is made of heatproof glass, silicon, or silicon oxide (Column 5, lines 51-55).

Regarding claim 4-5, the combination Park-Dai is silent in regards to the limitation of wherein a thickness of the substrate is in the range from 1 micron to 1000 microns, or in the range from 10 microns to 200 microns. However, it is considered within the capabilities of one skilled in the art the optimization of a workable range as an obvious matter of design engineering, as long as the mechanical stability and strength of the substrate is maintained. Thus, it would have been obvious at the time the invention was made to a person having

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<sup>1</sup> Smooth definition is as generally flat. See definition at *dictionary.com*

ordinary skills in the art to incorporate a substrate thickness within the claimed, since such modification is considered within the level of skills in the art.

Regarding claim 6, Dai further discloses a method wherein a thickness of the catalyst layer is in the range from 1 nanometer to 10 nanometers (Column 2, lines 52-53).

Regarding claim 13, Dai discloses a method for making a carbon nanotube-based field emission device comprising steps of providing a substrate having a surface, forming a carbon nanotube array extending from a selected area of the surface, the carbon nanotube array, having a bottom surface corresponding to the flat surface of the substrate, depositing a layer of metallic material on a top of the carbon nanotube array, and removing the substrate to expose the bottom surface of the carbon nanotube array so that the carbon nanotube array is thereby configured for acting as an electron emitting surface of the carbon nanotube-based field emission device. Although Park appears to show a substrate having a flat surface (Fig. 3B), Park fails to explicitly state that the substrate has a flat surface and the CNT's array has a flat bottom surface corresponding to the flat surface of the substrate and that the substrate is insulative. Park discloses directly growing the CNT's array over the surface of the substrate (Paragraph [0028]), however, fails to disclose forming a catalyst layer on a selected area of the flat surface of the substrate.

In the same field of endeavor, Dai discloses a method of growing self-aligned CNT's array over the surface of a smooth<sup>2</sup> insulative substrate (22, Column 2, lines 30-31) by providing a catalyst layer (26) on a selected area of the smooth surface of the insulative substrate. The disclosed method exemplifies the manufacture of CNTs in a confined patterned region, which allows for an accurate control of the size, shape, and distribution of the bundles on the substrate surface (Column 4, lines 31-35), moreover, Park further exemplifies the use of an insulative substrate (i.e., silicon, ceramic, Column 5, lines 51-55). Thus, it would have been obvious at the

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<sup>2</sup> Smooth definition is as generally flat. See definition at *dictionary.com*

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time the invention was made to a person having ordinary skills in the art to incorporate the step of forming a CNT's array by growing the CNTs from a catalyst layer formed over the smooth surface of a substrate as disclosed by Dai in the method of Park in order to manufacture an array of CNTs in a confined patterned region, which allows for an accurate control of the size, shape, and distribution of the bundles on the substrate surface. Furthermore, given that the nanotubes of the combined references to Park-Dai are grown from a surface of the substrate, the bottom surface of the CNT's array has the same bottom profile surface of the substrate, (i.e. a smooth surface).

Regarding claim 15, Dai further discloses a method wherein the substrate is made of heatproof glass, silicon, or silicon oxide (Column 5, lines 51-55).

Regarding claim 16, Dai further discloses the use of a smooth surface substrate. The recitation "is polished" is directed to a process limitation, patentability of a claim to a product does not rest merely on the difference in the method by which the product is made. Rather, is the product itself which must be new and not obvious. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). Accordingly, the structure implied by the process steps would be considered for assessing the patentability of product-by-process claims over the prior art (see MPEP 2113).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (2003/0027478 A1) in view of Dai et al. (US 6,232,706), and further in view of Jin (US 6,286,226).

Regarding claim 7, the references to Park-Dai fail to exemplify the limitation of the substrate is removed by an etching process. However, in the same field of endeavor, Jin

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discloses a method of transferring nanotubes from a temporary substrate to a permanent substrate, wherein the temporary substrate is removed by either peeling of or etching away the substrate, accordingly, Jin acknowledges the art recognized equivalence of both manufacturing steps, and it would be considered within the capabilities of one skilled in the art to selected one of either equivalents as an obvious matter of design engineering. Thus, it would have been obvious at the time the invention was made to a person having ordinary skills in the art to incorporate an step of removing the substrate by an etching process as taught by Jin in the method of Park-Dai, as an obvious matter of design engineering.

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 2, 8, 13 and 14 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 2 of copending Application No. 10/810,151 (US currently allowed). Although the conflicting claims are not identical, they are not patentably distinct from each for the following reasons.

Regarding claims 1, 2, 8, 13 and 14 of the instant application, claim 2 of copending application No. 10/810,151, claims a method for making a carbon nanotube-based field emission display, comprising steps of providing an insulative layer having a first surface, depositing a layer of catalyst on the first surface of the insulative layer, forming a spacer having a plurality of openings therein such that patterned areas of the layer of catalyst are exposed in the openings, forming arrays of carbon nanotubes extending from the layer of catalyst in the patterned areas, forming cathode electrodes on tops of the arrays of carbon nanotubes, forming gate electrodes on a second, opposite surface of the insulative layer offset from the patterned areas, removing portions of the insulative layer corresponding to the arrays of carbon nanotubes so as to expose the arrays of carbon nanotubes, and attaching an anode electrode having a phosphor screen to the above obtained structure, wherein a flatness of the first surface of the insulative layer is less than 1 micron.

While the claim fails to explicitly state the limitations of "the carbon nanotube array having a flat bottom surface corresponding to the flat surface of the substrate" and "so that the flat bottom surface of the carbon nanotube array is thereby configured for acting as an electron emitting surface of the carbon nanotube-based field emission device", however, given that the claim states the flatness of the insulative layer, it is considered to inherently impart the thus claimed limitations to the carbon nanotube array.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

#### ***Allowable Subject Matter***

Claims 9-12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.



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***Response to Arguments***

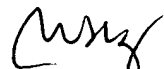
Applicant's arguments with respect to claims 1-8 and 13-16 have been considered but are moot in view of the new ground(s) of rejection.

***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mariceli Santiago whose telephone number is (571) 272-2464. The examiner can normally be reached on Monday-Friday from 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel, can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Mariceli Santiago  
Primary Examiner  
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